REMARKS/ARGUMENTS

The Applicants appreciate the thorough review of the present application as evidenced by the Official Action. As discussed in detail below, independent claim 1 is amended to more definitely set forth the claimed invention and to further patentably distinguish the claimed invention from the cited references. In light of the foregoing amendments and the subsequent remarks, Applicants respectfully request reconsideration and allowance of the present application.

To address the objections to the drawings under 37 CFR 1.83(a) and 1.84(p)(5) as stated in the Official Action, Figures 3, 5 and 6 of the drawings have been amended. In particular, Figure 3 is amended to illustrate the reinforcing fibers 35 oriented in a direction perpendicular to the axis of the annular body as recited in claims 7 and 15. Figure 3 is also amended to illustrate the filler material 34 disposed within interstices as recited in claims 8, 9 and newly amended claim 1. Furthermore, Figures 5 and 6 are amended to include reference numerals 50 and 54 mentioned in the description of the application on page 11, lines 7 and 18. Although the Official Action also states that the drawings do not show the reinforcing fibers extending about a lobe as recited in claims 14 and 16, Figure 3 illustrates reinforcing fibers 38 extending about respective lobes 32 and reinforcing fibers 40 extending about the outer layer 36, which extends about the lobes 32. Thus, the objections to the drawings under 37 CFR 1.83(a) and 1.84(p)(5) are overcome.

The Official Action objected to the specification for failing to comply with 37 CFR 1.71 and 1.75(d)(1) because the detailed description allegedly fails to provide proper antecedent basis for "said annular body and said plurality of ribs made of organic and inorganic materials," as recited in claim 6. The summary section of the specification states, however, that "[T]the annular body and ribs may be made of a metallic, organic, inorganic, or a combination of organic and inorganic materials" on page 3, line 32 to page 4, line 1. Thus, the specification as originally filed does provide support for the claimed subject matter such that the objection to the specification for failing to comply with 37 CFR 1.71 and 1.75(d)(1) is overcome.

The specification, however, is amended on page 8, line 2 to remove "or voids" from the sentence that describes the definition of the interstices to more clearly state the location of the interstices, which are different from the voids. In addition, the specification is amended to remove "and associated fabrication method" from the title of the patent application to more clearly state the subject matter of the claimed invention following the election of the damage tolerant shaft claims, namely claims 1-16, in response to the April 22, 2003 restriction requirement.

The Official Action also objected to claim 8 because it is not clear if the "interstices" recited in line 2 are the same as, or different from the voids recited in claim 1. The amendment to Figure 3 to illustrate the filler material 34 disposed within interstices and the amendment to the specification on page 8, line 2 to remove "or voids" from the sentence that describes the definition of the interstices clarify that the interstices recited in line 2 of claim 8 are different from the voids recited in claim 1. As such, a void is the relatively larger area defined by the annular body and ribs or the area within the lobes, i.e., reference numerals 12 and 22 in Figures 1 and 2 respectively. An interstice is the relatively smaller area defined between where the annular body and the ribs connect, where the ribs connect to one another, and/or between adjacent portions of lobes, i.e., the portions filled with filler 34 in Figure 3. Thus, the objection to claim 8 is overcome.

The Rejections of Claims 1-16 under 35 U.S.C. § 102(b) are Overcome

The Official Action rejected claims 1-16 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,097,870 to Williams. In addition, the Official Action rejected claims 1-16 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,888,601 to Quigley et al. Based upon the amendment to independent claim 1 and the subsequent remarks, Applicants submit that the rejections of claims 1-16 under 35 U.S.C. § 102(b) are overcome.

The Williams '870 patent discloses composite tubing that can be bent to a radius compatible with a reasonably sized spool (Col. 2, lines 47-50). As a representative example, the embodiment of Figure 1 of the Williams '870 patent includes a composite cylindrical member 8, a composite inner core member 2 and four composite web members 6. The composite

cylindrical member 8 contains fibers oriented from +/- 40 degrees to +/- 70 degrees, preferably +/- 55 degrees, and fibers oriented approximately perpendicular to the axis of the composite tubing. See Col. 2, line 57 to Col. 3, line 1 and Col. 6 lines 13-17. The inner core member 2 contains fibers that are oriented at 0 degrees to the axis of the tubing and the composite web members 6 contain fibers oriented from +/- 40 degrees to +/- 60 degrees, preferably +/- 45 degrees, to the axis of the tubing. See Col. 3, lines 5-27 and Col. 6, lines 9-13. The Williams '870 patent states that the fiber orientations optimize the ability of the composite tubing to carry the imposed set of loads and minimize the bending strain in the fibers. In addition, as shown in Figures 4 and 7, the composite inner core of 0 degree material may be widened to provide a plate-like core that extends to the outer cylindrical member. The advantage of this configuration is that more high stiffness and high strength material can be placed in the core without significant increase in the associated bending strains or sacrifice in the minimum radius curvature permitted for spooling. See Col. 5, lines 1-20. The thick web that divides the composite tubing into two opposing cells is made up of 0 degree and +/- 45 degree oriented fibers. See Col. 6, lines 3-5. In all of the embodiments described in the Williams '870 patent, the only materials included in the cylindrical member, the core member and/or the web members are composite fibers and a plastic binder to hold the fibers together, which is described as vinyl ester, epoxy, or a thermoplastic or thermosetting resin. See Col. 3, lines 28-31 and Col. 5, lines 53-56. Thus, the object of the composite tubing embodiments disclosed in the Williams '870 patent is to provide tubing that is flexible enough to be wound around a spool while also strong enough to have high axial stiffness and to withstand bending stresses, internal pressure and shear stress. See Col. 2, lines 44-50. No further filling is provided between portions of the materials that make up the cylindrical member, the core member and/or the web members, nor is there any filling in the interstices where the respective members connect to one another.

The Quigley '601 patent discloses resin-fiber composite tubular members with various combinations of fiber orientations in different plies and other reinforcement members. The fibers of the composite members are held together with a matrix material, which is described as resin-based materials, such as thermoplastics and thermosets. The thermoplastics include polyetherether-ketone, polyphenylene sulfide, polyethylene, polypropylene, and Nylon-6. The

thermosets include urethanes, epoxy, vinylester, and polyester. See Col. 1, lines 19-21 and Col. 2, lines 55-60. The composite members having a non-circular cross-section may have other reinforcement members, such as selectively concave walls (Figs. 4, 5, and 9, for example), selected added thickness at corners of walls (Figs. 6 and 9, for example), and/or added thickness selectively in each of two opposed walls (Fig. 6, for example). See Col. 2 line 61 to Col. 3, line7 and Col. 7, line 24 to Col. 8, line 29. The Quigley '601 patent states that the different wall thicknesses at different locations circumferentially about the cross section of each member can be attained with added resin, and can be attained with a combination of added resin and added fibers. See Col. 8, lines 37-41. The composite members having a circular or non-circular cross-section may have internal reinforcement, such as an interior rib extending along at least a portion of the length of the member, either essentially parallel to the axis or length of the member or selectively angled with regard to the axis of a straight member. See Col. 3, lines 13-35. Figures 10, 11, 12 and 13 illustrate examples of this type of internal reinforcement. Thus, in Figure 10, the internal reinforcement is a tube 200a that spans between a pair of opposed walls of the member and in Figure 11, the internal reinforcement is a web 202a that spans between a pair of opposed walls. See Col. 8, lines 58-65. In Figure 12, the hexagonal composite member has a multiple-element reinforcement member 204a configured with six radially extending spoke-like reinforcement elements that are joined together at their intersection in the axial center of the composite member, uniformly spaced and each joined at its radially outer end to the midpoint of one wall of the composite member. See Col. 9, lines 14-23. As shown in Figure 13, the internal reinforcing element, such as 206a, may be a foam-filled, such as an expanded polymer resin foam-filled, tubular core. See Col. 9, lines 28-34. While the Quigley, '601 patent does not describe how the reinforcement members 200a, 204a or 206a are formed or joined to the composite member, the Quigley '601 patent states that the reinforcing web 202a may be secured within the composite member after each member has been formed or it may be formed during the formation of the composite member, such that the reinforcement member is formed integrally with the walls of the composite member. The Quigley '601 patent, however, does not state how the reinforcement member is secured within the composite member when the members are formed separately. See Col. 9, lines 1-7.

In contrast, the damage tolerant shaft of the claimed invention includes an annular body that is symmetrical about an axis and ribs that extend inwardly from the annular body and connect within the interior of the annular body, such that the annular body and ribs cooperate to define voids extending lengthwise therealong. In addition, as recited by amended independent claim 1, a filler material is disposed within interstices that are defined between the annular body and the ribs and between the ribs at the point of connection. In another embodiment of the claimed invention, as recited by independent claim 9, the damage tolerant shaft includes lobes that are shaped relative to one another such that the lobes can be positioned to define an annular body and ribs extending within the annular body. In this embodiment, there is a filler disposed between portions of adjacent lobes. Thus, as described on page 8, lines 1-8 (with amended line 2) and page 9, lines 1-4, the interstices between the annular body and the ribs, between the ribs at the point of connection, and/or between adjacent portions of the lobes may be filled with any type of filler material, such as chopped carbon filler mixed with resin, unidirectional or fabric prepreg, organic or inorganic foam, adhesive honeycomb core, syntactic resin, wood, aerogel or any other compatible material. In addition, the location of the filler material 34 is illustrated in Figure 3, where it is shown in the interstices between the annular body and the ribs, between the ribs at the point of connection and between adjacent portions of the lobes. As such, whether the damage tolerant shaft of the present invention is made of metallic or composite materials, the interstices of the shaft may be filled with any type of filler material as described above, which is separate from the material that makes up the annular body, ribs, and/or lobes of the shaft

Although the Williams '870 patent and the Quigley '601 patent each describe composite members with internal ribs, neither the Williams '870 patent nor the Quigley '601 patent describe the formation of interstices and as such, neither the Williams '870 patent nor the Quigley '601 patent describe filling an interstice as claimed by amended independent claim 1 and independent claim 9. Instead, the composite material described in the Williams '870 patent and the Quigley '601 patent is apparently formed to construct the respective members of the composite members without any interstices at any point(s) of connection between the respective members. While the filler material of the claimed invention may be made of composite fibers and a binder/matrix material, the filler material is not part of any of the structural elements of the

damage tolerant shaft. Instead, the filler material described in amended independent claim 1 and independent claim 9 is separate from the annular body, ribs, and/or lobes of the damage tolerant shaft by filling in the interstices between the respective members of the shaft in order to provide added structural integrity to the shaft. While the Quigley '601 patent describes filling a tubular reinforcement member with a foam filling, no further filling is provided between portions of the materials that make up the composite member or the reinforcement member, nor is there any filling in the interstices where the respective members connect to one another. Instead, the foam filling described in the Quigley '601 patent would be analogous to filling the voids defined by the annular body and ribs of the shaft of the claimed invention. In addition, the Williams '870 patent does not describe any type of filling or any other material between the cylindrical member, the core member and/or the web members, nor is there any filling or any other material in the interstices where the respective members connect to one another. As such, neither the Williams '870 patent nor the Quigley '601 patent even mention the interstices between the respective members, let alone any type of extra filler material to fill in any interstices between the respective members, as recited by amended independent claim 1 and independent claim 9.

Since none of the cited references, taken either individually or in combination, teach or suggest the damage tolerant shaft of amended independent claims 1 and independent claim 9, Applicants respectfully submit that the rejection of these claims is overcome. Since the dependent claims include each of the recitations of a respective independent claim, the rejection of the dependent claims is also overcome for at least the same reasons as described above in conjunction with the independent claims.

CONCLUSION

In view of the amendments and the remarks presented above, it is respectfully submitted that all of the present claims of the present application are in condition for immediate allowance. It is therefore respectfully requested that a Notice of Allowance be issued. The Examiner is encouraged to contact Applicants' undersigned attorney to resolve any remaining issues in order to expedite examination of the present application.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

Rebecca M. Fiechtl

Rebecca M. Fiechtl
Registration No. 47,561

Customer No. 00826
ALSTON & BIRD LLP
Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Charlotte Office (704) 444-1000
Fax Charlotte Office (704) 444-1111

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop Non-Fee Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on September 12, 2003

Sarah B. Simmons

Sarah B. Simmons
CLT01/4604887v1

APPENDIX

Figs. 1, 2, 3, 4, 5 (Pages 1/3, 2/3, 3/3)

Replacement Sheets (Pages 2/3, 3/3)